Request for Information (RFI)

Technologies for large-area sub-arcsecond X-ray telescopes

General Information

Solicitation Number:	NNM16ZPS002L
Agency:	National Aeronautics and Space Administration
Office:	Marshall Space Flight Center
Location:	Office of Procurement
Posted Date:	March 28, 2016
Response Date:	April 27, 2016
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Notice Type:	Sources Sought
Synopsis:	
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Synopsis

The National Aeronautics and Space Administration (NASA) invites you to submit a response to this Request for Information (RFI) to assist NASA's Marshall Space Flight Center (MSFC) in its National Space Science Technology Center Research Facility (NSSTC) acquisition planning. The NASA Marshall Space Flight Center (MSFC) solicits information from Government, academic, and industrial communities pertaining to the technology needs for grazing-incidence X-ray telescopes with large aperture areas and fine (sub-arc second) angular resolution. Specifically, MSFC seeks this information to assist in assessing current technology capabilities, identifying promising development paths, and evaluating feasibility and schedule for maturing these technologies.

The NASA Astrophysics science vision, as outlined in the "Enduring Quests, Daring Visions" roadmap[1], highlights X-ray optics as a key area where significant technology advances are needed to achieve the observational capabilities required to address key science objectives. More quantitatively, the 2015 Physics of the Cosmos Program Annual Technology Report[2] identifies performance goals and objectives for lightweight high-resolution X-ray optics that feature (1) angular resolution of 0.5 arcsecond or better, (2) effective area up to 3 square meters in the roughly 0.1 to 10 keV range, (3) light weight ($\sim$1 kg/m^2 areal density) mirrors, and (4) low cost ($\sim$1 M\$/m^2 mirror surface area). Such advanced X-ray optics are needed to enable future strategic missions such as the X-ray Surveyor, a mission concept currently under study in preparation for the 2020 Astrophysics Decadal Survey[3].

Historically, X-ray focusing telescopes have relied on grazing-incidence reflective optics (typ-

ically 2 reflections) to bring X rays to a focus. Large effective collecting areas are achieved by nesting multiple co-aligned, co-axial grazing-incidence mirror pairs in order to optimize the available aperture. Consequently, large-effective-area X-ray telescopes must use thin, lightweight mirrors to achieve a high degree of nesting and acceptably low mass. For such mirrors, angular resolution is affected by internal stresses, coating-induced stresses, and mounting-induced distortions that cause medium- to large-scale figure errors.

Therefore, in addition to requiring technology that can inexpensively fabricate large numbers of precisely figured thin shells or shell segments, future high-resolution mirror development must show capability to coat and to align and mount precisely formed mirrors, possibly with (static or active) post-fabrication figure correction. Several examples of technologies currently under development for producing precision figured thin x-ray mirrors are reviewed in O'Dell et al. (2014)[4].

MSFC solicits information pertaining to these and related technological challenges for timely and cost-effective production of lightweight, large-area sub-arcsecond grazing-incidence X-ray telescopes. The information obtained through this RFI will be compiled, summarized, and made available to the X-ray Surveyor STDT who will identify and assess technology gaps in order to inform NASA's programmatic funding priorities.

Requested Information

Recognizing that robust development and maturation of technologies for X-ray telescopes is crucial to a compelling and executable X-ray Surveyor mission concept, this RFI seeks input that will help define (1) the current state of the art in terms of capability and readiness, (2) the feasibility and schedule for raising the corresponding Technology Readiness Level (TRL), and (3) new and emerging technologies and/or significant engineering alternatives.

This RFI seeks input on the following topics: high-resolution light-weight mirror fabrication processes, mirror coating processes and methods for stress mitigation; static and active post-fabrication figure correction techniques; mounting and assembly schemes; alignment; metrology; and mass production approaches to any of these toptics.

Responses should provide, at a minimum, (1) a description of the technology, what technological challenge it addresses and how it confronts that challenge in the context of the desired sub-arcsecond, large-area X-ray optic (2) an estimate of the current Technology Readiness Level and a justification for that estimate (3) a plan and schedule for advancing the technology to TRL 6.

This RFI is not a solicitation for the procurement of goods or services. The Government is

under no obligation to issue any such solicitation in the future as a result of this RFI. The Government will not pay for any costs associated with responding to this RFI.

Instructions for Responding to this RFI

All responses to this RFI must be in the form of a PDF document submitted in electronic form via email to jennifer.b.mccaghren@nasa.gov. The body of the email message should identify and provide the name, institutional or organizational affiliation, address, telephone number and email address of the primary point-of-contact for the response. Other key institutions, companies and individuals collaborating on the RFI response should also be identified. Responses must be received by the due date specified above, shall use 12-pt font or larger, and should not exceed ten (10) pages in length.

Only material suitable for full and open distribution shall be submitted and submittals shall be considered approved by the providing organization to be suitable for full and open distribution. Responders shall not submit proprietary information, export controlled information (including EAR and ITAR restricted information), nor confidential information in response to this RFI.

NASA Clause 1852.215-84, Ombudsman, is applicable. The Center Ombudsman for this acquisition can be found at https://prod.nais.nasa.gov/pub/pub_library/Omb.html.

No solicitation exists; therefore, do not request a copy of this solicitation. If a soliciation is released, it will be synopsized in the FedBizOpps and on the NASA Acquisition Internet Service (NAIS). The Internet site, or URL, for the NASA/MSFC Business Opportunities home page is http://prod.nais.nasa .gov/cgi-bin/eps/bizops.cgi?gr=D&pin=62 It is the offeror's responsibility to monitor the Internet cite for the release of the solicitation and amendments (if any). Potential offerors will be responsible for downloading their own copy of the solicitation and amendments, if any.

References

(1) http://science.nasa.gov/media/medialibrary/2013/12/20/secure-Astrophysics_Roadmap_2013.pdf

(2) http://pcos.gsfc.nasa.gov/technology/2015PCOSPATRRev1.pdf

(3) http://science.nasa.gov/astrophysics/2020-decadal-survey-planning/

(4) O'Dell, S. L. et al. SPIE 9208, 05 (2014)

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